

Remarks

Reconsideration of this Application is respectfully requested.

Claims 1-5, 7-11 and 13-20 are pending in this application. Claims 1, 4, 10 and 16 have been amended. Claims 6, 12 and 18 have been canceled and their subject matter has been incorporated into their base claims.

Based on the above amendments and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

In the Final Office Action dated October 14, 2005, claims 1-20 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Aziz et al., U.S. Patent No. 6,779,016 in combination with Huang et al, U.S. Patent Publication No. 2002/0091697.

Interview at the USPTO on December 5, 2005

Applicants' representative thanks the Examiner for the courtesies extended during the in-person interview at the USPTO of December 5, 2005, and for giving the Applicants another opportunity to present their arguments in person. During the interview the differences between the claims and the cited references (particularly Aziz) were discussed. The Applicants' arguments, which were also presented to the Examiner, are summarized below.

The Examiner also suggested that the claim language be clarified to ensure that there is no confusion between physical servers and virtual servers, and that the last clause of the claim 1 be amended to avoid any ambiguities. The above amendments therefore follow the Examiner's suggestions.

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Claims 1-20 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Aziz et al., U.S. Patent No. 6,779,016 and Huang et al., U.S. Patent Publication No. 2002/0091697. These rejections are respectfully traversed. Although many of these issues were discussed at some length during the interview, Applicants believe that it is worthwhile to reiterate these points for purposes of advancing the prosecution of this case.

Aziz is directed to a "Virtual Server Farm" (VSF). The VSF takes multiple servers, and makes them act as a single server. The present application is directed to the exact opposite of Aziz: virtual environments, or "one machine, multiple virtual servers," see, e.g., FIG. 2 and corresponding portions of the specification.

As discussed during the interview, all the independent claims recite that no emulation of hardware is required. Aziz specifically teaches hardware emulation (col. 14, lines 15-22):

In one alternative, a wide area backbone may be based on Asynchronous Transfer Mode (ATM) switching. In this case, each local area VLAN is extended into a wide area using **Emulated** LANs (ELANs) which are part of the ATM LAN **Emulation** (LANE) standard. In this way, a single VSF can span across several wide area links, such as ATM/SONET/OC-12 links. An ELAN becomes part of a VLAN which extends across the ATM WAN.

Thus, this difference alone is sufficient to distinguish the pending claims from Aziz.

The problem that Aziz is solving (overload) is the exact opposite of the problem solved by the invention disclosed and claimed in this application (underutilization). Nothing in Aziz teaches or suggests a solution to this problem, singly or in combination with Huang.

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The Office Action proposes to combine Aziz and Huang in a manner that is directly contrary to the purpose of Aziz (and, in the proposed form, requiring additional "inventing"). Huang describes a graphical user interface for remote access of a single computer. Aziz' Virtual Server Farm has no need for an interface that allows someone to remotely access one of the machines of the Virtual Server Farm. Huang, obviously, does not contemplate remotely accessing a VSF--only a single machine. If one were to use the interface of Huang to try to remotely take control of one of the physical machines of Aziz, that physical machine would have to be taken out of the VSF.¹ All that would be left is (a) a "truncated" VSF on the one hand, and (b) a computer that is being remotely accessed on the other. This is self-evidently not what Aziz contemplates, and would defeat the entire purpose of Aziz' VSF.²

The Office Action, at paragraph 9, appears to suggest that reversing the arrangement of Aziz in order to solve an entirely different problem is a relatively trivial matter:

one [of] ordinary skill in the art at the time of the invention knows that combining servers in one box or having servers to be connected separately is not a novelty. Also, Aziz disclosed in the above statement that it interpreted as combining the servers virtually in one group and called it VSF.

1 This does not even take into account the question of how one would select the particular physical machine, since to the external user, all the machines of the VSF appear to be one.

2 Applicants do not dispute that it is theoretically possible to modify Huang to make a GUI for a Virtual Server Farm, and to modify Aziz in some fashion to use some form of an interface for remote access -- but this is not taught or suggested anywhere in these references, and is nothing more than hindsight. In any event, it would require additional "inventing," not merely combining the two references.

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In reality, the problem of virtualizing a single machine to act as multiple servers has been particularly difficult to solve, and until SWsoft, the assignee of the present application, came out with its Virtuozzo product, which embodies the ideas described in the present application, no adequate solution to this form of server virtualization has been commercially available. Any useful solution needs to address a number of very difficult issues, such as multiplexing between the various processes and threads running on different virtual servers, control over physical resources of the computer, sharing of the control, isolation of the various virtual environments, and whether (or how) to provide access to physical resources with or without emulation, since each virtual environment believes that it in fact "owns" the entire machine.

Failure to adequately address any one of these problems will result in what is essentially a useless "paper" product. SWsoft's Virtuozzo has been installed on thousands of machines worldwide, and SWsoft estimates that approximately 300,000 virtual private servers are running at any given time using Virtuozzo technology described and claimed in this application.

Scalability and the problem of memory utilization as claimed in the independent claims are closely related. Each server with a full-fledged operating system and some user applications can require on the order of 10-20 MB. In a physical computer with even 2 GB of RAM, if application, data structures and kernel are not shared (and, therefore, require dedicating memory), 100 instances of the virtual server can require (10 MB for the kernel + 10 MB for applications) $\times 100 \approx 2$ GB. As a consequence, simply replicating the virtual servers through

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memory would very quickly run into a memory bottleneck.³ Solving the scalability problem by not dedicating memory to each virtual environment is a key reason why Virtuozzo has been successful in the marketplace – without dedicating memory, thousands of virtual servers can now run on the same computer.

The Office Action cites the following paragraph in Aziz as disclosing the aspect of “virtual computing environment constructed and arranged to separate user processes on the level of name space and on the basis of restrictions implemented inside said operating system kernel”:

In another embodiment, the Web pages enable the customer to choose one of several VSF service plans, such as automatic growth and shrinkage of a VSF between a minimum and maximum number of elements, based on real-time load. The customer may have a control value that allows the customer to change parameters such as minimum number of computing elements in a particular tier such as Web servers, or a time period in which the VSF must have a minimal amount of server capacity. The parameters may be linked to billing software that would automatically adjust the customer's bill rate and generate billing log file entries.

Respectfully, this is incorrect, as discussed during the interview. Separating user processes on the level of name space and on the basis of restrictions implemented inside the operating system kernel refers to each virtual environment having its own virtual instance of the same file or process (e.g., KERNEL32.DLL), as well as their own processes and user defined settings (e.g., IEXPLORE.EXE). All the virtual environments are able to access “their own” files despite having the same filenames, but cannot modify them in a manner that affects any other virtual environment. (See discussion on page 10 of the specification.)

³ Even with memory page swapping, which often results in a severe performance penalty, some part of the kernel, as well as actively used parts of application data/code, need to remain resident.

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Aziz teaches the opposite – each physical server of Aziz has its own physical copy of KERNEL32.DLL. There is no need to protect it on the level of name space, since modifying the KERNEL32.DLL file on one physical machine is irrelevant to all other physical machines.

In sum, Applicants respectfully submit that the present claims clearly distinguish over Aziz, and that the above amendments place the claims in condition for allowance. Applicants therefore respectfully request reconsideration and withdrawal of the rejections, and an allowance of this application.

For the record, and in the interest of full disclosure, Applicants also would like to bring to the Examiner's attention that on the same day as the interview in this case, Applicants also conducted an in-person interview with Examiner Pierre Michel Bataille relating to pending Application No. 10/005,590. In that application, VPN references (Cheng et al., U.S. Patent No. 6,823,462 and Hoke et al., U.S. Patent No. 6,701,437) in combination with Huang et al., U.S. Patent Publication No. 2002/0091697 (the same Huang et al. reference) were used to reject claims directed to other aspects of virtual environments. It remains Applicants' view (as stated during the interview on December 5) that the VPNs are no more relevant to the claimed virtual environments than are VSFs.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action

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and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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